I TOO HAVE SPUN

BEING A COLLECTION OF NOTES
ON SPINNING

BY

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THE HISTORY OF THE CONGRESS

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TO

THE THOUSANDS OF SISTERS, MOTHERS
AND GRAND-MOTHERS WHOSE
LIVES ARE MADE BEARABLE
AND BRIGHTENED BY
SPINNING AS
RENOVATED
BY BAPU.

PREFACE

If my sole title to authorship had been the efficiency of my spinning, this brochure would not have been produced at all. Only a bad spinner can write a brochure on the subject, not a good one. Really, my title lies in my interest in spinning. To take an interest in sports, to study athletics, for example, it is not necessary to be a sportsman or an athlete oneself. I trust, therefore, I shall not one day be challenged to a contest in spinning by some kind but exacting reader. I am, however, open to a challenge in respect of my knowledge of the science.

It has been my constant habit to do two things at a time—rather a bad business, I admit. But pressure of work often compels me to break the wholesome precept in this regard. Even as I spin, I talk, arbitrate, teach or dictate. Recently, when I visited Mahatma Gandhi at Poona, he said he was pausing in his spinning in order to talk to me. I asked him if it was necessary to do so when he could spin and carry on a conversation at the same time easily enough. 'Ah,' he said, 'but the spinning suffers. It is all the better for concentration.' I put the statement to the test later and found it true.

Many people complain of want of time for spinning. That is a common complaint, too, with all who wish to avoid drill or discipline. It is only the busy man who has time for everything. The idler has really no time except for idling.

I too have spun. I have spun spasmodically. I took a considerable interest in spinning in the early twenties, and was a regular spinner for several years. But this spinning generated a persistent and incurable pain in the shoulder, for spinning, though it starts as a sacramental

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CHAPTER I

SPINNING—THE CHARKA

To study the working of the *charka*, to systematize its operations, to analyse and remedy its defects, and effect improvements in this little machine—these have been the achievements of those who have taken to spinning with real zeal. It may not be given to all to invent; but in a country whose civilization and culture are being smothered by the products of the West, whose arts and crafts are being swept out of existence by the onrushing tide of machinery, it is certainly our duty to rediscover some of the secrets of the country's dead and dying arts, to revive as many of them as possible and promote their growth. To this end, the simple tools of old have to be rediscovered, improved and popularized. What the book is to the literate, the tool is to the craftsman. The carpenter loves his chisel and the smith his hammer; the barber loves his razor and strop, the dhoby his stone and iron; the mason loves his trowel and the potter his wheel; the cobbler loves his awl and the woodcutter his axe; the digger loves his spade and the sawyer his saw; the musician loves his *sitar* and the painter his brush; the weaver loves his loom and the spinner his or her *charka*. A good tool takes you more than half-way to perfection. The rest is a little practice, coupled with interest and zest.

The Machine

I have called the spinning wheel a little machine and described spinning as both a science and an art. These statements need closer examination. What really is a machine? Any device or contrivance which facilitates

manual labour and makes the slow processes consciously performed by hand orderly, quick and automatic may be termed a machine. Thus, a grinding stone that resolves grain or pulses into tiny fragments is a machine, though of the simplest type imaginable. A simple paddy pounder is in itself not a machine. But in a *dhanki*, where you operate the wooden pestle by lever action, you have a machine. Let us pass from the linear movements involved in pounding to the circular ones in spinning. Originally, spinning was performed by taking a spindle and winding a few feet of yarn round it and then rotating the spindle with a flip of the thumb and the index finger or by a smart rolling of the spindle against the thigh. As the spindle spins round its axis, you draw out the sliver to which the yarn is attached. This process is repeated when the spindle slows down. Some of the finest yarn, up to 200 or 300 counts, was spun in this manner by Brahmins who prepared *Yagnopaveethams* (sacred thread), though nowadays Manchester or mill yarn is being freely used for the purpose. From this simple device has been evolved the little machine called the *Charka*, which is a corruption of *Chakra* (a wheel). The wheel is its principal mechanism. The rotatory motion imparted to the spindle by thumb and index finger is here transmitted by turning a big wheel, the revolutions of which are communicated to a small wheel built round the spindle. Once the spindle has been set spinning on its own axis, the rest is easy, and the process is identical with that involved in spinning on the *Takli*, just described above. The spinning wheel is thus a machine whose operations are planned and executed on a scientific basis. The efficiency of the *charka* therefore depends on the manner in which you apply the principles on which its construction is based. One essential principle relates to the ratio that the

revolutions of the two wheels in the machine bear to each other. In a good charka, for every single revolution of the large wheel, the spindle must execute 120 revolutions. Such a ratio depends on the gear ratio (as it is called) of the two wheels—the big wheel which is operated by hand and the small wheel attached to the spindle. A good analogy is furnished by the bicycle. The bicycle is propelled by the back wheel, the front wheel being only a steering mechanism. The back wheel is connected by means of a chain which fits into the small toothed wheel at the hub with a fairly big wheel at the pedals, called the chain wheel. In the earlier models of the bicycle the toothed wheel at the hub and the chain wheel were of nearly the same size. This did not help develop the proper gear ratio. Manufacturers, therefore, set about increasing the size of the chain wheel in relation to the hub wheel, until for a single revolution of the chain wheel the latter executed seven or eight. This ensured greater speed in terms of the energy expended.

In the charka, which too is a machine with two wheels, however, the whole contraption is stationary and the revolutions executed by the spindle impart twist to the yarn drawn out. Thus the higher the gear ratio the greater the twist in terms of the energy expended on the operation. Experience has shown that a gear ratio of 1: 120 develops just the necessary twist The difficulty of obtaining this ratio lies in the fact that the charka must be handy and portable. It is possible to increase the size of the larger wheel in order to develop greater power, but beyond a certain stage this would make the charka unwieldy. Usually the diameter of country charkas in Andhradesa has from time immemorial been 22 inches. In Bihar the old charka had a diameter of only 16 or 18 inches. In Chicacole (a fine-count centre of Andhradesa), the wheel even to this day is big, with a diameter of 28 to 30 inches.

improved the quality of the yarn spun. Now the A.I.S.A. considers 450 yards of 16 counts yarn per hour as the standard production in calculating spinners' wages. Mahatma Gandhi has placed before himself the ideal of a wage of eight annas *per diem*, the spinner working at the charka for eight hours a day at 450 yards per hour, and in addition devoting an hour to carding his cotton and making his own slivers.

Art and Science

Spinning is both an art and a science. All art depends upon the human impulse towards self-expression, but all art is, at the same time, subject to certain scientific laws. The painter knows what combination of colours pleases the eye, but the colours are there in nature—in herb and drug—and the proper blending of the products of these forms the scientific basis of the painter's art. So is it in music, where the amplitude and pitch and timbre of sound form a study independent of one's impulses, while their harmonization makes the musician's art. So is it in poetry, where the roots of rhyme and rhythm are to be found in words, but their selection and juxtaposition constitute the subtle art of the poet. Or take surgery, which is both a science and an art. The anatomy and the physiology of the human body and its pathology constitute the scientific background to the cunning art of the surgeon, who, with his knife and scalpel and forceps, rescues human beings from suffering by amputating a gangrened limb or excising diseased tissue. Science dictates the limits, while art determines the grace of execution.

Likewise in spinning, a whole world of science and art is involved The science regulates the structure, and the art perfects the technique.

foot on the foot-rest and repeat the process, and so on, to the very last, when you find yourself enthroned on the saddle, and pedalling for very life. The process is complete with, of course, many falls and bruises, abrasions and lacerations, and occasionally a fracture or dislocation, or both, and invariably sprains and other injuries of diverse kinds to the body. The bicycle shares your misfortunes. You go to the doctor, and the machine goes to the repairer. I believe there is hardly one simple-minded individual today who would care to study an 'instrument of instructions' such as this before he set about learning cycling. The normal procedure is to buy, borrow or temporarily steal a bicycle and ask a friend to plant you on the seat, push you off and then run by your side to keep the machine going. You might also ask your friend to help you hold the handle-bars and direct the front wheel as you speed along. You would master the whole process in three hours—less than it would take you to understand (much less remember or follow) any written instructions.

So it is with the spinning wheel. When I am spinning, my grandchildren flock around and disturb me. As a matter of fact, they do not intend disturbing me—they begin to learn. I ask them to turn the wheel. They do so with growing pleasure Then I ask them to stop for a second, turn the big wheel backward for another second, and then forward again. One cycle of movements is complete. After quarter of an hour's guidance, I ask them to follow what I am doing with my left hand. While the child has been turning the wheel I have been drawing out the thread. When I stop, I ask him to stop. While he turns the wheel backward, I release the yarn from the last inch of the spindle. While he turns the wheel in the right direction again, I wind the yarn round the spindle,

and as he continues this movement, I draw out more yarn. Here is a complete cycle, both in respect of the child's activity and mine. He helps me as I spin out the yarn. When this has gone on for a couple of days, the child's interest is aroused and he says, 'I shall take the sliver now.' I hand it over. Strangely enough, the first time that this grandson of mine, three and a half years old, takes hold of the sliver, he draws out the yarn beautifully, but it is not uniform. After a time, when the yarn has been wound up, I relieve him, start the second round with the sliver and hand it over to him once again. When this has been done half a dozen times, he feels that it is beneath his dignity to be relieved of the sliver every now and then—he is eager to start the next round after the winding process himself. He finds it much more difficult to start drawing out the yarn from the point of the spindle. Either it gets entangled round the spindle or breaks off—owing to over-twist (due to undue hesitation in drawing on the sliver) or (under-twist due to too hasty drawing). The process goes on, the child tires of it and runs away to a more entertaining pastime. Next day he comes again; starts with the easier process of turning the wheel and flies on at once to the more difficult task of drawing out the thread, this time faring better. On the third day he wants to displace you and do both things together, turning the wheel and drawing out the thread—and fails miserably, gives up the game and bolts. The fourth day he comes to you asking why he is unable to do both operations at the same time when he is able to do either singly. If you launch on an explanation he will not understand—he insists on 'learning by doing'. Let us, therefore, try to understand why it is that, when even a child can perform the two movements separately, even an adult cannot perform the two together at the first attempt.

The simple explanation is that the two movements have to be co-ordinated. Rotation of the wheel is a circular movement, while drawing the thread out is a linear movement. In the former you turn the handle of the wheel round and round. In the latter, you move the sliver in your hand upwards and downwards. Leave the charka aside for a moment and see whether you can, while swinging your right arm round and round, wave your left arm up and down. No, you can't do it readily, but a little practice will enable you to do so—and so well at that that you will begin to wonder why it was you were unable to perform the exercise a moment earlier. What you have learnt by exercise or argument, the child learns to do involuntarily, by instinct.

How does the child learn cycling? He simply steals his father's bicycle, gets on to the pedals, thrusting one leg through the frame, and struggles to push forward. He presents a most amusing spectacle, it is true; but he masters the trick all right. Even so, before the reader has been able to master the theory of spinning presented in these paragraphs, the shrewd child has learnt the art of spinning, though he remains ignorant of the scientific principles involved.

I was travelling to Bombay in August, 1942, and missed the train connexion at Guntakal. There was a Parsi family too in a similar plight. It consisted of a tall elderly father, a buxom mother and the son, a sprightly youngster of six summers. The lad's interest was aroused as I sat spinning on the Yerawada Charka on the station platform. I had ten long hours to devote to spinning as I waited for the next train. The boy would run about for a minute or two and come back to watch me spin for about five minutes. Then the performance was repeated. I gently motioned to him to

sit beside me, whereupon he ran away. One had to be careful with Parsi parents—they might not quite take to your rough clothing and your new-fangled charka, for to them both might spell sedition. The invitation to sit down beside me had only sent the boy scampering away, but his curiosity dragged him back. A renewal of my invitation made him look imploringly at his parents, and I seized the opportunity to point out to them that their dutiful son was seeking their permission to join me. That being cheerfully granted, the boy sat down. I tried the trick of making him handle the wheel, then the sliver, then both ; and in an hour, the boy, much to the delight of his parents and to my enlightenment, had learnt to spin. That is how spinning is learnt. Trial and error, or learning by doing—that is the only process—the royal road to mastering an art. When you have learnt the art you can study its technique.

The art and the technique of any calling, craft or occupation are closely and inextricably intertwined. After all, the origin of all mechanical skill is in the fingers of the human hand. Is it the floral design on the border of a *sari* or *dhoti*, is it the delicate lace-work on the edges of a table-cloth, is it the *khalamkari* on a door curtain, or the *phulkari* on a Kashmir shawl ; is it the totalizator adding figures or the printing rotary that prints, cuts, folds and delivers the issues of a daily newspaper ? It is all the work of a machine manipulated by the hand and executing what the brain has planned and conceived and expressing perhaps the emotions of the heart, to perfection, with a considerable saving of labour and time. Only, some machines, like the spinning wheel, are infinitely simple; others, like the spinning mill, are exceedingly complicated.

The hand-spinner would, therefore, do well to get acquainted with the components of his little machine, so

that he may set it right without someone else's aid. When a razor is blunted, the barber cannot always go in search of someone else to sharpen it for him; he has to hone his little instrument himself. The young cyclist cleans and oils his own machine and sees that its parts are perfectly adjusted, and in proper alignment. The spinner must, likewise, keep his machine perfectly clean, the planks free from dirt and grit; the steel parts grey and glistening; the wheels in perfect running order; the *chota* and *bada mals* evenly stretched; the spindle true; in a word, the whole machine working smoothly and noiselessly.

We have already considered the structure of this machine—how the turns of the handle revolve the big wheel, which communicates its movements to the spindle through the speed wheel, the revolutions in the horizontal plane being converted into revolutions of the spindle round its own axis in the vertical plane. We have also described the connecting parts, and stressed the need to keep them clean. We may now proceed to consider the actual working of the machine.

We have learnt enough to realize that the spinning wheel is, as it were, a living organism that responds to the care you bestow upon it, even as your horse does to the kindness you shower upon him. If you do not treat your charka as you would your young child, it will not treat you well either. It will fret and fume, rattle and wobble. It may not spin at all, or it may spin too rigidly so that the yarn snaps. Unwelcome noises will mar the harmony of its operations; the big wheel may refuse to revolve freely; the winding may become irregular and the spindle drop off. It may be the sliver will vomit lumps of cotton and the yarn snap. Imagine you are giving a demonstration or taking part in a competition, and the examiner inspects your charka. Apart from the

quality of the yarn you produce, the perfection of the machine on which you operate and the elegance with which you handle it will count for a lot.

To deal with the problems of spinning, one must naturally be fairly well acquainted with its practical side. The art must and can be acquired only by handling the instrument. The writer has learnt from his own experience that a medical student acquires the art of administering an enema or an injection not by attendance at lectures or going round the wards, but only by practical experience. I myself learnt cycling on a small terrace, and one day I ventured out on a bicycle ride in the streets and made surprising progress until I came to a cross-road, where, vacillating between two routes, I cut across into the drain!

To learn spinning, sit by the charka, selecting whatever position suits you most—generally one keeps the spinning wheel at right angles to oneself. Your hands now go into action, the right turning the wheel and the left engaged in drawing on the sliver. At first you may make a hash of the whole thing, for it is not easy to co-ordinate these two movements. But as success comes to you, you acquire new faith. That is so in respect of everything you set out to achieve. The point is to apply both your mind and limbs to the task, patiently, devotedly and diligently.

Position

If you draw out the yarn directly at right angles to the spindle, it is apt to get cut, leaving no brushy fibres at the broken end. The fracture is a clean one due to the sharp point of the spindle. For one thing, this may happen whatever the position of the charka in relation to the spinner if the point of the spindle is needle-sharp. The spindle must not, of course, be so sharp as all that. The degree of sharpness may best be judged by actual practice.

The running yarn may be at 135 degrees with the spindle. If the angle is greater than this, the yarn you have wound up runs off the spindle, and instead of your spinning yarn, you merely pull out yarn already spun; and the tyro is often perplexed by an unending flow of yarn from the point of the spindle, but he will soon realize that he is not spinning at all, but only unwinding.

Seat

Old country-women, in days gone by, used to squat on a stool, six to nine inches high, while spinning. This gave them a longer sweep. How long each pull should be is a matter with which we shall deal presently. When you are spinning coarse yarn, very often you chance to draw out very fine yarn that snaps. This gives you the impression that to spin fine is to risk breakage. The sooner a spinner gets over this apprehension, the better for his performance. You have all seen the strands of a spider's web. They are perhaps fibres of 500 counts or more, yet they are ever so strong, and are capable of withstanding the fury of a storm. The strength of the yarn lies in its twist and uniformity. Uniform thread of the right degree of twist will not snap, howsoever thin it might be. A good spinner or a spinner who wants to become a good artisan must, therefore, constantly strive to spin finer and finer yarn until he reaches at least 20-24s. It is as incorrect for one to believe that thin-spun yarn snaps as it is to imagine that only shouting into the telephone-receiver will make you audible at the other end. Just as in a telephone conversation, it is not the loudness of the voice but its pitch and timbre that count, so in spinning it is the strength, twist and uniformity of the yarn. It is not enough if the yarn is strong, it must be uniform. Twist, of course, is a delicate quality, and of this more later.

Sometimes as you spin, the wheel ceases to revolve smoothly. On investigation, you find a tightness about the thread at the point of the sliver. On further examination, it is revealed that the yarn at the root is not only drawn tight, but that it is stout and twisted, so that, if you begin to draw on it with your right hand, a very stout but well-formed cord emerges from the very axis of the sliver. The fact is that in feeding the yarn on the sliver you ought to take the yarn right round the sliver. If, on the contrary, you feed it at the same point towards the centre of the sliver, you will, instead of tapping the circumference, be pulling at the centre. The remedy is to tap the circumference of the sliver first and then progress towards its centre.

Again, when the yarn gets entangled on the bobbin after a breakage, be sure that in unravelling the tangle, you pull at the loose end, keeping the yarn on the back of your last three fingers. That will help stretch the yarn and loosen the folds in the tangle.

Before joining up the broken ends of a thread you must acquaint yourself with the direction of the twist. The twist in the fibres is from the left hand side to the right, so that, when the yarn has snapped, you have to twist the filaments from the right hand side to the left. If you do this you will not experience any difficulty in joining broken ends. When you spin there are apt to be specks and lumps of uncarded cotton on the yarn; these cause breakages and must be removed with your right thumb and index finger. For this purpose you must let the thumb nail grow—but in no case must its edges be rugged. As you spin you may keep the thread tapping the sliver circularly if you hold the sliver not in the axis of the yarn drawn, but at a small angle to it. If the yarn is allowed to take its natural course from the sliver, it

the leather sliding easily; but, left to itself, it gets impacted again. The remedy is to prevent the leather loop from rising above the spindle, keeping it pressed down between the two limbs of the 'W' of the wooden pedestal, or even bringing it forward to your side. I have also tried the alternative of placing only a square bit of leather ($\frac{1}{2}'' \times \frac{1}{2}''$) on your side of the spindle hub and none on the off side.

CHAPTER III

SLIVER

Where do we begin spinning? That is a problem. The process starts with the sliver. The two ends of a sliver vary in appearance. One tapers off with its loose and flying filaments of cotton. The other resembles the mouth of a collapsed rubber tube clean, smoothly rounded and well rimmed. The general tendency, and perhaps the right practice, is to begin with the tapering end. The loose filaments easily dovetail into the brushy end of the yarn in hand and the two easily join each other. But it has been common experience that, as the sliver is exhausted, the last inch of it becomes thicker and the cotton tends to fall off in a lump, that is, the yarn that is being drawn out tends to snap. I have examined the point carefully; even as I am writing these lines, I have been looking into this problem and I confirm the experience referred to. A friend in the 'Unknown Fortress' was so irritated by this that he had to put away the last inch of each sliver, first, as it was a source of annoyance due to repeated snapping of the yarn, and second, as the yarn was not of the same fineness as the rest of the sliver yielded. He was accustomed to spinning yarn of 30 to 35 counts with ease, and in order not to mar the uniformity of his performance, he rejected the stumps. From these discarded stumps I later spun 3,500 yards of 16 counts.

I have experimented with slivers, spinning from the stout, tubular side first. There is generally no breakage, and I have come to this conclusion, that the latter method is more satisfactory, a conclusion which I state with some

hesitation, though it has been reached after considerable deliberation and balancing of experiences.

Character of the Sliver

You will find slivers from the bazaar full of specks, but that does not make them otherwise bad. The cotton may be good, the slivering may be excellent, but the specks cause frequent breaks and tire out, if not irritate and disgust, the spinner. These specks can be removed with the nails of your thumb and index finger as each length of yarn is spun; but this slows down your operations considerably. And if you let the specks remain sticking to the yarn, they are a nuisance to the weaver, for they lead to frequent breakages.

But even if there be no specks, the slivers may be far from satisfactory because of the quality of the cotton or the process of slivering itself. Or it may even be that slivers properly prepared out of good cotton have been exposed too long. Slivers so exposed absorb moistures, become bloated and dishevelled, and vomit lumps of cotton as you spin. The best way of preserving slivers is to place them in a closely packed tin or other receptacle with a weight on top. Our grandmothers kept their slivers in a pot packed close, and with a weight to press them down.

There is no greater pleasure in spinning than working with really good slivers. Spinning then becomes an attractive and engrossing pastime, a veritable intoxication. Under favourable conditions, it may soon develop into an irresistible mania, like novel reading or cards!

But in order to make spinning enjoyable it is necessary to have good slivers. Without these, for all your zeal, you will turn out a poor spinner. Food prepared at home is superior to that available in restaurants, not because you

Then he watched with his own eyes these women with their ancient bows and dumb-bells (strikers) performing the business of cleaning cotton with the efficiency of the professional carder—and making slivers too. This solved one of the fundamental problems of Khaddar—the Mahatma's worries were ended. To this day he remembers that particular experience with pleasure. We too might take a lesson from it!

An expert spinner draws his thread without effort. The spectator is hardly able to distinguish between the operations of winding and spinning. Remember that a round of spinning and winding and back to spinning involves the turning of the wheel from left to right, then a brief movement in the reverse direction and then a resumption of the original movement, and also the upward and backward movement of the left arm, a momentary pause as the thread unwinds itself at the last inch or more of the spindle and then a movement of the arm in the opposite direction as you let the yarn wind itself, and, later, a resumption of the pull on the sliver. How varied are these movements of the right and left arms, of the thread and of the wheel. The expert spinner, however, displays such celerity and skill in the processes that the looker-on is amazed. In fact, the entire thing is much easier than it sounds.

Again, the yarn is of uniform calibre, whether thick or thin. That is a gift or a knack or a matter of genius—call it what you will. Anyway, uniformity is the supreme point. Then, the twist is of the right degree—neither too little nor too much. Too little of twist weakens the fabric, too much militates against softness and produces the effect of crepe.

The processes so far described are all connected with one another, as preliminaries to the vital craft of weaving,

to which they are auxiliary. The cotton grower must remember the cotton merchant, the cotton merchant must subserve the interests of various different craftsmen beginning with the cleaner. The cleaner must do a good job of his cleaning, for otherwise, all the subsequent operations are imperilled. The carder, in his turn, must leave no specks in the cotton, neither lumps. He must remember the maker of slivers, who, in turn, must execute his job neatly, making his slivers neither too tight nor too loose. He must bear the spinner in mind, who has to spin out uniform yarn of the right degree of twist, and of medium fineness of at least 15 to 20 counts.

The A. I. S. A. has been trying to protect the interests of Khaddar-weavers by demanding that mills should not spin below 19s or 20s and should not weave below 40s. Only if these reforms are accepted and set in operation will the hand-spinning and hand-weaving industries be stabilized. And with increased wages, spinning may yet become a whole-timecrafts; it needs must when the yarn produced conforms to the standards laid down and is acceptable to the handloom-weaver in the same measure as mill yarn is today.

try to bring them closer to each other. If the *Mal* yields with just a modicum of hesitation, it is working smoothly. If the ends readily snap together the *Mal* is loose, if the ends hardly respond to the movement, the *Mal* is unduly tight. Running the *Mals* on to the wheels is no easy process in the earlier stages, though, later, with practice, it becomes easy enough.

Bada Mal

First of all loop it round the groove in the hub of the speed wheel with both your hands and see that it rests in the groove. If the speed wheel rotates with the movements of the *Mal*, you may take it that it is in position. Then you fix the *Mal* round the bigger wheel, inserting it first in the groove on the right and driving it on to the point nearest the centre of the side on which the lock is placed. Then gently rotate the wheel clockwise, while the *Mal* is being helped into the groove on the left. Presently you will find the whole *Mal* in position round the groove of the main wheel and round the groove of the metallic hub of the speed wheel.

Chota Mal

The next operation is to fix the *Chota Mal* in position. Take it round the groove of the speed wheel itself and take the other end of the *Mal* round the four fingers of your right hand and fix it round the pulley on the spindle, taking care—and this is the most important point—to see that the right side of the loop goes over the pulley and the left under it. This ensures that when the big wheel is turned clockwise twist is imparted to the yarn. Never insert the *Chota Mal* before inserting the *Bada Mal*, for the latter has to go below the level of the *Chota Mal* in relation to the speed wheel. You may ask: What will happen if

CHAPTER IV

FIRST LESSONS IN SPINNING

Let us presume that you are, in a way, acquainted with the art. You have watched your mother spin and in her absence handled the charka, even as you might have handled your father's bicycle or his car in his absence. Once a four-year-old child in the driver's seat of his father's car went through the motions at which he had often observed the chauffeur; he pressed the clutch and then, gently releasing it, pressed down the accelerator, and the car began to slide forward. Apparently the chauffeur had not cared to apply the brakes or neutralize the gear. It was no end of a job getting the car under control. How this incident illustrates a child's keen powers of observation and, at the same time, his spontaneous imitative capacity!

We shall now study certain points the beginner has to learn and remember. If I were an examiner in spinning, I would lift the two wheels of the Yerawada Charka and see whether there is any dirt on or around the axles. The wooden plank on which the wheels rest must be perfectly clean, free from dust of any kind, tags of yarn, or caked-up oil. The pivots should be bright and shining except for the clean fresh oil. You have, therefore, to start with cleaning every part of the charka and oiling it at three places—the main wheel, the speed wheel and the spindle, at the points where it rests in the grooves. Take care that the two *Mals* are neither too tight nor too loose. You do not have to begin spinning in order to determine this. Take hold of the two sides of the *Mal* between your thumb on one side and your four fingers on the other and

try to bring them closer to each other. If the *Mal* yields with just a modicum of hesitation, it is working smoothly. If the ends readily snap together the *Mal* is loose, if the ends hardly respond to the movement, the *Mal* is unduly tight. Running the *Mals* on to the wheels is no easy process in the earlier stages, though, later, with practice, it becomes easy enough.

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Chota Mal

The next operation is to fix the *Chota Mal* in position. Take it round the groove of the speed wheel itself and take the other end of the *Mal* round the four fingers of your right hand and fix it round the pulley on the spindle, taking care—and this is the most important point—to see that the right side of the loop goes over the pulley and the left under it. This ensures that when the big wheel is turned clockwise twist is imparted to the yarn. Never insert the *Chota Mal* before inserting the *Bada Mal*, for the latter has to go below the level of the *Chota Mal* in relation to the speed wheel. You may ask: What will happen if

these processes are reversed—that is, if the left arm of the *Chota Mal* goes above the pulley and the right arm below, and the main wheel is turned counter-clockwise? Theoretically, this is permissible. But as one is aware, there are certain conventions observed in all crafts. Take a screw, for example. The screw is driven into place by a clockwise movement. This holds good all the world over.

There is one little point to attend to in tying up the *Chota Mal*. While the *Bada Mal* is a ready-made sling, the *Chota Mal* is a long piece of twine made, of course, of handspun yarn. You will have to learn how to make it. But before that you must learn how to tie up the two ends. After taking the required length of twine, you may tie up the two ends in one of two ways—either with a surgeon's knot or a sailor's knot.* You cross the two ends first. Then, in making the second crossing you may so take the thread that at the two crossings the right-to-left thread occupies the upper level in both or alternately upper and lower levels—the same would be true of the left-to-right thread also. So far as I could discover, it made no difference which way it was done—but the knots had to be right. In tightening up the knot, one end is apt to slip. Then again, after you have spun a while, the knot is apt to slip. It is one thing to learn to tie the knot and another to prevent its slipping. I learnt at Wardha, Sevagram, how to do it. The floating ends of the knot are untwisted and inserted into the *Chota Mal* on either side, which also is untwisted, and then let go so that you only see the knot and not the residual ends of the *Chota Mal*. After adjusting the *Chota Mal*, fix the leather straps on the off side of the pulley, unless you have only two separate leather bits, or, as sometimes happens, only one.

* See Diagram II in Appendix III.

There is another source of accidents that I have come across. Once while I was spinning, the *Chota Mal* snapped. I joined up the broken ends and, placing it in the groove of the speed wheel, fixed the spindle on the pedestal. It slipped off the pedestal. The fact was that the *Chota Mal* had run off the groove of the speed wheel. I thought the matter simple enough, and while the spindle lay behind the lowered pedestal, tugged at the *Chota Mal* with both hands and was replacing it in the groove of the speed wheel when suddenly the sharp spindle point shot into the small finger of my left hand, causing a puncture that I shall not easily forget. It is not always necessary to reject such a *Chota Mal* outright, for you can break it at the point where the thread has peeled off and join it up with another bit from an old rejected *Chota Mal*. You should, therefore, not throw away superannuated *Chota Mals*, for bits even a span long are likely to prove useful some day. If the spindle as a whole moves too easily when yarn is being drawn out and the point tends to turn away from the base at an angle, the inference is that the *Chota Mal* is loose. This defect is easily remedied by pushing the spindle plate farther off and tightening the *Chota Mal*.

I usually spin seated on a chair, with the charka standing on a cot. The chair generally faces the cot. Once I tried to carry on with the chair placed parallel to the cot. The *Chota Mal* began to slip off the hub of the spindle and all attempts to replace it failed, until I had changed back to my normal position facing the cot.

Which end of the sliver is one to begin with? This point has already been discussed at length and the tentative conclusion reached has been that the balance of advantage lies in starting with the firm end. For over a year I had practised on this principle. But in January, 1946, about a year after I had written the earlier pages

of this brochure and laid them aside, I discovered that if the sliver happened to be particularly firmly made and hard-rolled I experienced some difficulty in drawing out the yarn when it traversed the circumference of the sliver and came to the centre—especially after operating an inch from the firm end of the sliver. The yarn spun tightly at the central point and pulled the spindle itself away from its bearings or strained at the centre and snapped—sometimes both happened simultaneously. I was then obliged to change to the other end of the sliver, when this trouble ceased to obstruct my work.

If there are continual breakages while you spin you must carefully investigate the reasons. Is the sliver bad? That is likely. But sometimes the spindle is needle-pointed and cuts the thread—whatever the angle at which it is drawn out. Possibly, in addition, the needle point is hooked, so that it is the hook that cuts the thread. All that you need to do then is to rub off the hook and blunt the point a bit on a stone.

Noises in Spinning

I have often used a spindle that I had picked up from the debris. It had no leather padding on either side of the iron pulley. I placed a stiff wad of old cloth there. It worked satisfactorily, except that the musical hum one is accustomed to in spinning gave place to a harsh noise. I merely oiled the cloth pad and the noise immediately ceased, and there again was the normal humming.

Once I discovered that leather piece on either side of the hub of the spindle had become worn out and that the hole through which the spindle was passed had become an open one—a crescent, as it were. Nevertheless, I wanted to carry on with it; but there was a rattling sound all the time, as of metal rubbing against wood.

I cut off the end and bored a fresh hole with the sharp point of a spindle so that not more than three-quarters or an inch of the sharp end of the spindle could pass through the newly bored hole. I put the spindle back in position, and started spinning. The *Chota Mal*, I then observed, simply turned in the groove of the pulley without setting the spindle rotating. What was the matter ? I examined every part of the mechanism minutely, but without success. At last it struck me that the butt end of the spindle being thicker than the last inch of the sharp end, the hole bored was too small for it. So I enlarged the hole and the spindle began to turn right enough !

How to Loosen A Twisted Fold of Yarn

Loosening a twisted fold of yarn while it is being spun is a matter that deserves careful attention. Merely pulling the yarn from the sliver end will not do. That may only worsen the situation. The main point to remember is so to handle the yarn as to bring the two bits of yarn on either side of the twisted fold parallel to it and then, holding the fold itself by its loop end, to unfold the whole. Sometimes a ring of cotton tightly binds the two ends of the twisted fold at its neck. That has to be released.

Spindle

It is presumed that when you start working at the wheel, the spindle has already a little yarn wound round it. If not, you will have to do so yourself. And that in itself is an art. At the very outset you must see that the metallic disc is properly fixed on the spindle, and before doing that there are certain important points to bear in mind. You must know at what point to fix the disc. It must be fairly beyond the grooves on the forked digits of

the wooden pedestal in which the spindle is fixed. You fix it in position with the help of the *Chota Mal*. From the edge of the groove on your side, leave a space of about a third of an inch, on a part of which you may wind a little knob of yarn that would intervene between the edge of the groove and the disc. This will prevent the disc from striking against the wooden digit of the pedestal and making that rasping noise produced by the metal striking repeatedly against the wood. Having mentally marked the distance, you begin to wind a piece of yarn round the spindle, making a knob about $\frac{1}{8}$ inch high, and pass the end of the yarn through the hole in the disc and insert the disc through its central hole round the spindle, or rather, pass the spindle through the central hole of the disc—with the yarn running from the knob beyond and emerging through the hole. Then wind the yarn round the spindle on your side of the disc, so that the disc is caught up between the two yarn knobs and tightly fixed. But this by itself is not enough. You must gum the two knobs well and dry them up. From the knob on the side of the long pointed arm emerges a fairly long bit of yarn, with which you start. It is wound round the spindle up to its point, with half a yard or so to spare. You apply the sliver to this free end and begin to spin.

But there are a few further points you must attend to. Oil the parts with a mixture of equal parts of kerosene and cocoanut oil—or you may use instead of cocoanut oil, groundnut or kardi or mustard oil, according to the usage of the province. The oiling is carried out with a can. Press a few drops into the central holes of the main wheel and the speed wheel—if necessary raising the former a bit. Move the wooden wheel up and down as you lubricate it. Then proceed to the spindle, where the

two grooves, the thread and the spindle itself have all to be treated in the same fashion. But you will ask what the thread referred to is. Examine the two forked digits of the pedestal. Each has two holes—one above and the other below the groove. You have to pass a well-twisted thread through the two holes on either digit turning it so as to have the ends of the thread on the side of the speed wheel and the body of it on the offside of the prongs. Tie a knot at one end and leave the other end loose and long. The knotted end is tightly drawn to the hole. On the bodies of these threads on each prong which pass over the groove in the wooden prong rests the spindle, held in position by the *Chota Mal*. Whenever, owing to wear and tear, the thread gives way, you gently pull the loose end of the thread on to the groove. The thread must be midway in diameter between the *Chota Mal* and the *Bada Mal*.

Now your *Mals* are fixed, the machine is oiled, the spindle adjusted. There is yarn hanging loose from the sharp point. You have only to take the sliver and launch on the adventure of spinning. If the *Chota Mal* breaks, you have to make a fresh knot—cutting off the loose ends. This will make the string shorter. You have, therefore, to draw the pedestal nearer the speed wheel. In fact, the approximation will be effected automatically when the *Chota Mal* is shorter.

Then arises the question whether the two-pronged mobile pedestal should, when finally adjusted, be vertical (the position that many choose) or be inclined towards the side of the speed wheel. The latter, I feel, is the correct position. How much then should it incline? That has to be decided by the spinner's own experience. If the *Chota Mal* is too loose you have to move the pedestal farther away, and if it is too tight, you have to move the pedestal closer.

There are a few other points worthy of note. If there is a small loose filament within range of the spindle, it is apt to be sucked up into the reel by the current set up in spinning. You must, therefore, get rid of all loose filaments on your charka. While you are operating the main wheel, don't you press the handle downward? One day a friend, whose charka had gone out of order, borrowed his neighbour's—a magnificent one, brand new in appearance, spick and span, with fresh *Mals*, everything almost perfect. But he complained, on operating it, that the wheel emitted a rasping noise. I was summoned to attend to this ailment. I felt that the *Bada Mal* was tight, but, nevertheless, to investigate the matter thoroughly, I started to spin. It has been well said that a doctor's eyes are in his hands. Likewise, the spinner must be able to perceive things with his thumb and index finger, discern whether the *Mals* are at proper tension. He must cultivate the gift of pronouncing, by the very thrill imparted to the digits, when the yarn has acquired the right amount of twist.

In spinning you sometimes come across a length of over-twisted yarn tugging at the sliver. If this is not promptly attended to, the result may be the emergence of a lump of cotton absolutely useless for spinning. As soon as you suspect that the pull of the yarn on the sliver is not smooth, you may adopt one of two courses. You may gently draw the yarn out of the sliver, as you would on a *takli*, and when you have drawn out perhaps a couple of inches, normal conditions may be restored, permitting you to resume your spinning. Or else, you hold the sliver suspended in the air by the tight-pulling yarn at a height of six to nine inches from your fingers, when the sliver will rotate in the anti-twist direction so as to untwist the yarn at its point of emergence from the sliver. You may then resume operations in comfort.

The big wheel sometimes wobbles and makes a noise as if rubbing against a metallic part. Yes, it is impinging against the iron axle rod. The reason, it may be thought, is obviously that the rod is worn out and the wheel loose. But it may also be that the axle is loose in its bearings. A slight tightening of the nut at the base may set the matter right.

Wobbling of the spindle is caused, amongst other things, by the disc being too far away from the wooden prong of the pedestal. Strictly speaking, it must be ¼ inch from it. In between there is the lump of yarn adjacent to the disc which prevents its grating against the pedestal. The wobbling decreases or ceases altogether as the bobbin begins to bulge.

If you suddenly feel a tightness about the revolutions of the wheel it is ten to one that the leather on the spindle has developed a kink, which you have to unloose.

In releasing a clump of yarn from the spindle, it sometimes happens that the first stretches of the yarn are wound tightly round the spindle, with the rest of it wound loosely. This you must remove from the end and release gently. The yarn has developed varying degrees of twist, diminishing as you reach the end of it. Again, sometimes, the whole thread is soft, without any appreciable degree of twist, so that it gets lumped up in a loose mass at the point of the spindle or thereabouts. The best way of releasing this lump is gently to sweep it off the end of the spindle; then take hold of the filaments at the end, carefully stretch them out, impart the necessary twist and proceed to resume spinning.

If you want to prevent the yarn from getting overtwisted and dragging at the sliver, you may only have to adopt a simple strategy. Take care while you spin that *the yarn does not drain the sliver at the same point*—

particularly at the centre. The thread itself operates as a living body, very much like a creeper stretching out in search of the sun or a support. The yarn goes in search of loose fibres and thus wanders over the loose ends of the sliver. You can help it to find such loose filaments by rotating your sliver slightly—particularly as you resume spinning after each winding.

CHAPTER V

WINDING

When you are winding the yarn you have spun around the spindle, you may adopt a little trick in order to prevent the clumping of broken threads on the spindle. We have just seen how difficult it is to unwind and release this clump. You can avoid such excrescences by interposing under the coloured cloth which forms the background of the yarn that is being spun some big book or a cigarette tin or some similar article. Now, when the thread snaps, the distant or farther end is caught up on the ridge thus formed, preventing its crumpling itself round the spindle. You can then easily lay hold on this end and join it up with the end in your hand.

If you do not interpose a ridge under the coloured cloth, you may spin with the yarn on a level with your hips or even lower—of course, assuming that you are seated on a small stool—instead of drawing out the thread shoulder-high. In that case when the thread snaps, the distant end does not travel on to the spindle, but simply coils itself up on the coloured cloth spread below.

Remember that when you wind the yarn you have spun around the spindle, you must attend to two things. The shape of the spindle is important. The winding must be done evenly, so that there is a fairly conical reel of yarn. If the mass of yarn round the spindle is not uniform the reel is spoilt and this causes complications when one starts hanking. Likewise, if you insist on winding yarn almost to the sharp point of the spindle, hanking operations are embarrassed. The winding must be tight. An examiner will just squeeze the bobbin to determine

whether it is loose or tight. If it is tight, it indicates that the twist is normal. If the twist is below normal the bobbin is apt to be loose.

If you draw your thread almost in continuation of the spindle, the yarn already wound round the bobbin comes off the spindle and strikes against the wooden charka box, making an unwholesome noise. If you spin at right angles to the spindle its sharp point snaps the yarn.

The introduction of the speed wheel has dispensed with the necessity for continuing to turn the big wheel when you have stopped drawing out yarn in order to impart twist to the yarn already spun. With the speed wheel, it is found that the yarn is twisted even while it is being drawn out, so that with the practised spinner both hands cease operations simultaneously.

When you wind the yarn round the spindle do not go too far back towards the disc. If you do, you are apt to wind it round that bit of the spindle between the disc and the wooden pedestal. See that your bobbin looks artistic. You have seen a carpenter turn a piece of wood or a machine-man turn a piece of steel. The skilful workman imparts beautiful contours to the piece of wood or steel. The legs of a cot, a table or a chair reveal the ingenuity of the turner. But where he is cutting out the wood, in winding, you are filling in yarn—and the bobbin acquires a beautiful shape, now conical, now domelike. Wherever there is a gap, fill it. Once you have filled the bobbin to the level of the rim of the disc, do not lump much yarn above it for a distance of ¼ inch from the rim. You may raise the level of the bobbin to any height beyond that distance.

The winding of yarn round the spindle after you have drawn the full length of yarn is a highly interesting

and artistic process. You can shape it as you please—on the pattern of a temple dome or minaret of a mosque. But whatever the shape and whatever the size you may work up to, you must start at the disc and develop a fine cone about an inch and a half, and when you have wound up to the edge of the diameter of the disc, you gradually wind towards the end of the spindle, in no case leaving less than an inch of the metal showing from the point of the spindle. You are likely to be tempted to have as big a cone as possible; you may get, say, 400 or 500 yards from this cone, or you may make a full hank of 840 yards or even 1,000 yards out of two spindles. Every spinner is expected to have more than one spindle—not merely to meet any eventuality of damage, but also to enable him to get a full hank by rewinding the yarn on the spindles on to the hank. This has the clear advantage of not disorganizing your machinery too often. The spinner can doubtless manage with one spindle, but in that case he will be compelled to stop in the process of spinning—a most absorbing occupation —and divert his attention to rewinding. That means not merely a break in the continuity of a pleasurable avocation, but also the trouble of removing and refitting the main wheel. It is understood, therefore, that you have more than one spindle and that you complete your hanking at one stretch. But that forms a different subject, to which we shall revert at a later stage. The winding on the spindle itself is a process you must study carefully in order to avoid certain pitfalls.

In the process of winding, the thread sometimes snaps. Let us look into the reasons.

If it has snapped clean, with the two ends disclosing no flying filaments, it was due to excessive twist or because the thread was far too thick at the point. In either case

you have to 'set' the fracture, in the language of the surgeon. But you cannot make the ends dovetail into each other as there are no loose filaments. You can certainly produce filaments for this purpose by untwisting each broken end for an inch or so; but that implies that you have to revert to the spinning wheel, a waste of time you can avoid.

Here is a better method. Take the two sharply defined ends together between your right thumb and index finger (if you are right-handed, as most of us are) or the left thumb and index finger (if you are left-handed) and twist them together between the two digits by rolling the two under the thumb on the index finger—then join the conjoint thread on to the bottom thread (nearer or proximal thread) taking care to twist the three inwards, not outwards. If, however, you join the twisted end with the upper (distant or distal) end you will have to twist the three outwards. 'Inwards' means towards your left hand—'outwards' means away from it. Now resume spinning. If you do not feel confident that your jointure is strong enough, wind the thread on hand, including your jointure, round the spindle and then, making sure that an additional round or two have been given, proceed with your spinning as if nothing had happened. If, however, one or both the fractured ends are brushy, the only thing to do is to bring the filaments together so that they overlap an inch or so and then, holding them lightly between your left thumb and index finger, to turn the main wheel slowly until the very feel tells you that the soft broken ends have stiffened into a length of firm thread.

If one of the ends is brushy and the other twisted, or if both ends show the same amount of twist but are not sharp enough to be joined by the first process, then you

have to untwist one or both ends as the case may be and go through the process described above.

All this holds good so long as the thread is broken somewhere between your hand and the spindle. But, sometimes, the thread falls off the sliver, dragging with it, in the majority of cases, a speck to which the accident is really due, or it snaps at such a point that the length of the thread thus broken off is not worth salvaging. More often than not you discard this bit. But a miser like myself would be tempted to save it. In that case it is a question of what you would rather do—save time or save substance.

In spite of my experience that it is an idle waste of time to try to save fragments less than 9 inches long, I have—if only to discipline myself—submitted myself to the trouble of joining the ends. You may ask where this discipline comes in. It is in spinning so conscientiously that you do not leave even an inch of thread as wastage. If you spin 20 slivers on end, the operation must not result in any wastage beyond the specks that might have been present in the slivers themselves. An easy way of using up bits is to tack them on to the sliver itself, with the filamented ends towards the point of the sliver, so that, as you spin, these broken fragments become part of the sliver. This may be done with all broken ends, whatever their size. You can thus avoid not only the loss of time involved in joining fluffy ends, but also the ugly debris that otherwise accumulates beside you.

But in winding there is one major difficulty you have to face. The distal or distant end of the broken thread does not always remain accessible to you; often it mischievously winds itself round the spindle's end. If it stopped with that the spinner's task were easy. But, as if to add to his troubles, the thread gets so entangled that

even if you obtain hold of the loose end, you cannot draw the thread out easily. To pull it by the end is to make a mess of the whole business, worsening the tangle. What you have to do is to get hold of the end by bending over it and draw as much of it as comes off easily and then turn the main wheel in the reverse direction—that is, counter-clockwise. But here again you face a difficulty. For one thing, with your eyes glued to the broken end and the tangle, you have to grope blindly for the handle of the main wheel. But suppose you manage somehow to get hold of the handle, there is yet another difficulty facing you. To move the main wheel even by a quarter of an inch, whether backward or forward—in *this* case backward—would be to set up such a number of revolutions in the spindle that the tangle you are trying to unravel might easily become more complicated. A better method is to handle the *Chota Mal*, which is within the range of your vision, even as you are handling the broken end of the thread. The movement of the *mal* in the reverse direction will set up gentle revolutions in the spindle, and if your left hand is operating diligently, the tangle will have been easily unravelled.

Even so there is another difficulty to be overcome. In the very act of breaking the twisted fold mixes with the rest of the thread and winds itself round the end of the spindle. You cannot unravel the tangle merely by getting hold of the broken end and gently drawing it out. The more you draw, the worse the tangle becomes. There is a point of some importance to note in this connexion. When you are unloosening the tangle on the spindle, do not hesitate to use both hands. Partly because of your posture, and more perhaps because your right hand is busy operating the main wheel or the *Chota Mal*, you may be tempted to tackle the job with the left hand

happen? Either you are drawing the yarn in a line almost in continuation of the axis of the spindle, or there is hardly sufficient yarn wound round the free end of the spindle to catch up the thread and hold it in place on the point of the spindle so as to straighten out the yarn. When the bobbin is full, there is perhaps less than an inch of free margin on the spindle, or the yarn in hand starts from this side of the crest of the bobbin. In any case, the point to bear in mind is this. However small the free end of the spindle, see that the yarn is closely entwined round it before it reaches its point. When the bobbin is almost full, start from its farther side.

Here is an experience worth recounting. Once it happened that the *Chota Mal* gave way. I set it right and resumed spinning. There was some loose yarn waiting to be wound up. I set about doing it, when, to my surprise, instead of the yarn winding itself round the spindle, the yarn on the spindle began to unwind itself. I made two unsuccessful attempts to proceed with the job on hand. But the more I tried to wind the yarn up, the more it unwound itself; obviously the mechanism was working in reverse gear. I examined the *Chota Mal* and found that it had been pegged on to the pulley in the reverse direction. The necessary readjustment had to be made before I could carry on.

In winding, a number of spinners do not raise the left arm above the head, but merely draw it towards the right shoulder at the level of the navel or the chest and wind the thread. In doing this one sets up a peculiarly rhythmic movement. When you draw your left arm to the right, the right hand rotates the big wheel backwards (counter-clockwise). The two movements synchronize. Then, again as you allow your left hand to be drawn forward as you wind the yarn, you start rotating the big

wheel clockwise. These two movements again synchronize in direction, though they differ inasmuch as the left arm is pulling the thread and the right continuing to turn the wheel.

When you wind the yarn, you must see that there are no twist folds on it, for their presence on the hank makes the weaver's task more difficult. Sometimes you hardly notice any, but the thread breaks nevertheless. On a careful examination of the sliver you will discover a piece of hair, or a thin fibre of the gut on the bow used in carding. It is important to note that despite your best effort you can never establish a joint between filaments of the yarn and such hair or fibre of gut. The two simply refuse to blend.

When you are winding the yarn you have spun, it is likely, if you grip it too tightly, that it will strike against the end of the cone of the bobbin. And if you hold it loose, it is apt to fall into twisted folds, which require unravelling. The right thing to do is to loosen your hold a bit as you wind.

CHAPTER VI

SOME COMMON MISTAKES IN SPINNING

Now we pass on to details of the technique of spinning. The movements of the two arms are automatically co-ordinated when you begin winding the yarn round the spindle. It helps a great deal if, when each time you unwind, you leave a fair length of yarn (9 to 12 inches) unwound between the point of the spindle and your hand. Indeed, it may advantageously be much more. This depends, however, upon the distance at which you sit from the charka and your position. If you lean back against a plank by the wall, the length will be necessarily greater. If you are sitting huddled up, it may be less. In having a long bit of yarn carried over, you do not lose anything—on the contrary, you gain a lot, because the twist that resides in the yarn just wound up is in inverse proportion to the length of yarn carried over. If such 'carry-over' yarn is long, when in the next round of spinning you draw on the sliver, the yarn attached to it does not pull it down from your hand, but begins imperceptibly to lengthen of itself—as if you were drawing yarn off a reel of pack thread. If the stretch of yarn between the spindle point and the hand at the start is short—say 6 inches—the twist in this span is excessive, and when you draw at the sliver, this thread attaches itself tightly to the end of the sliver, with the result that such yarn as is drawn out is thick, looking almost like rope. This spoils the whole operation—you have to discard this 'monster' and reattach the 'carry-over' yarn to the sliver.

A good spinner, as I have said, produces yarn without letting the onlooker quite make out when he begins his second round. With the beginner (sometimes even with practised operators) as I have had occasion to notice and correct, every time a fresh length of yarn is drawn out the point where he begins is indicated by a small lump, so that one may describe the yarn so spun as consisting of nodes and internodes.

This should not be. In one case I observed a friend, who spins 30s to 35s, always having only 6 inches of thread as 'carry-over', bending low over it and starting spinning with the utmost care and deliberation. I advised him to sit at a greater distance from the charka and to leave 18 inches of yarn as 'carry-over'. He fared better, but the nodes had not disappeared. Then my attention was drawn to the way he was holding his sliver. He was holding it near the neck in a firm grasp between thumb and index finger, allowing the filaments of cotton little space to move in and attach themselves to the starting length—indeed choking them altogether. In consequence, I advised him to leave 18 inches of starting length, insisted upon his leaving $\frac{1}{3}$ inch of the sliver below his digital grasp and holding the sliver lightly, so that the starting length of yarn might draw easily on the filaments of the sliver, blend its own brushy end and filaments with those of the sliver and form finely twisted yarn.

I hesitated a good deal before offering this advice for two reasons. For one thing, I cannot spin even a good 20 as against his 35. For the other, unsolicited advice is seldom welcome. Not infrequently it is spurned, and that leaves you with a feeling of regret and disappointment. But this friend accepted the proffered advice cheerfully and with gratitude; from the very next day his outturn increased threefold, and his pleasure in his self-imposed

task multiplied tenfold; all his sense of irritation and frustration vanished.

There was yet another correction this expert spinner had to adopt. He was drawing too short a thread. Starting with a 'carry-over' of barely nine inches, he was drawing another 9 inches or 12—now bending over the wheel to reach the end of the short starting length and now trying to eliminate the lumps in the yarn on resumption. His posture, too, was uncomfortable, his movements were restricted and his achievements poor, even while his potentialities were magnificent and his skill of a very high order. The green or black cloth spread out for the yarn was soon as dirty as a stable—littered with filaments of various lengths, rejected stumps of slivers and clumps of cotton. There was no more of this when the carry-over of yarn was longer and the span of yarn drawn out at each stretch too was increased. This latter, as I have already explained, should neither be too little nor too much. One may easily get into the habit of moving one's hand as high as the outstretched arm will go. But this is apt to cause frequent breaks in the thread, which will only slow down the speed of operations, and perhaps give you a pain in the limb as well (see earlier section). To draw the thread to the height of the shoulder is about right.

There is a great deal in the spinner's posture. The best position is not to face the spindle directly, but to sit at an angle to it. The advantage of this position is that you are able to see the whole thread you have spun straight in front of you. But you may ask whether it is not right for the spinner to face the spindle while winding. It is—but that is momentary—while, if he sits facing the spindle, he will have to turn towards the thread all the time its full length is being drawn out, and that is a greater strain to be sure.

CHAPTER VII

HANKING

There is just one more process that remains before you send your yarn to the weaver. I have already emphasized the need for every artisan to remember that his work goes into the hands of a brother-artisan for further treatment before the finished product emerges, ready to be marketed. The yarn spun must therefore be handed to the weaver in a presentable form, capable of being appraised and evaluated by the purchaser. The buyer should be able to determine the count, and test the uniformity and twist of the yarn offered to him. For this purpose you must prepare what is called a hank, that is, you must unwind the yarn on the bobbin and arrange it in continuous loops of 4 feet each. There are various devices in use for this purpose, some rough and ready, others more elaborate. What is called *Āsu* in Telugu is a flat piece of teak, well planed and provided with two small pegs at a distance of 2 feet, so that one complete loop gives you 4 feet of yarn. You prepare your hank by winding the yarn from the bobbin round the two pegs until you have 90 full loops. Ninety loops give you 90 × 4 feet, i.e. 360 feet or 120 yards. You tie up these loops neatly, so that the total length of the yarn is easy to determine. It is now easy too for the weaver to unwind this yarn again to prepare his warp. When seven such bundles have been prepared—of course, with the two ends of the total length of 840 yards clearly showing, so that the weaver may pick up either end—you moisten them with water, dry them and then twist them all into one *Pidi*. The moistening and

the twisting are intended to prevent the yarn getting untwisted.

In place of this rough-and-ready device of a plane with two pegs, you sometimes come across a simple flat piece of wood with two niches on one side into which, in the process of winding, the yarn alternately passes. The yarn may be wound round a bamboo wheel too. But in every instance each complete loop of yarn must be 4 feet long.

In the Yerawada Charka you are supplied with two flat pieces of wood forming a cross (+). In the centre of this contraption is a hole, enabling it to be mounted on a projecting axle. The four ends of this wooden cross are provided with four metallic pegs fixed into holes at the ends of the wooden arms. Having mounted this cross on the axle of the speed wheel you proceed to hank.

There are two methods of carrying out this operation. In the first, you hold the bobbin and start hanking with the end of the thread tied round one of the metal pegs and passing through the hooked rod in your drawer, which is held upright. In the other, you retain the bobbin where it is while you are spinning, release the *Chota Mal* from the groove of the speed wheel and peg it on to a nail by its side so that it holds the bobbin in position. Then you hold the thread with your thumb and index finger interposed between the bobbin on the one side and the wooden cross and the hook on the other. Now, as you turn the cross round and round with your right hand the bobbin unwinds itself through your fingers and through the hook, on to the wooden cross and gives you the required number of loops. The entire length of each complete loop is in this instance too 4 feet, so that 90 rounds give you 120 yards of yarn. Then tie a knot. Prepare six more bundles of a similar kind, so that you

possess altogether 840 yards. Tie up the ends, detach the whole bundle, moisten it and twist. The advantage of allowing the thread to pass between your fingers is that you are thus able to remove any specks on the thread with your nails. The bundles will be firm too.

It is while hanking that you notice the harm caused by specks in the bobbin. When the yarn is unwinding itself from the bobbin, a projecting speck halts the process. But the right hand, meanwhile, goes on turning the cross, with the result that the thread snaps. And one's difficulties do not end with that. The broken end on the hank often gets entangled in the bundle, and may require as much as half an hour to retrieve. (Here you realize the advantage of having bundles of 90 loops each.) If you cannot readily find the broken end, brush the threads on the hank gently with some waste in the reverse direction. The end will soon be thrust up. Then tie up the two broken ends and go on with your hanking.

You sometimes find while hanking that the yarn has, instead of winding itself neatly round the four metallic pegs of the wooden cross, cut across diagonally from one peg to another. It even happens that the yarn sometimes merely winds itself round the hub of the speed wheel. These mishaps are not generally noticed in time, for your eyes are fixed on the bobbin in your left hand or on the hook under which the yarn is passing. The accidents occur when you hold the bobbin too low. The yarn being released from the bobbin towards the hook is then slanting, not horizontal as it should be.

When the hanking is complete get hold of the end of the yarn and wind it round the hank three or four times; take hold of the starting point too, loosen it and wind it round the hank similarly. The weaver inspecting the hank can then see the two ends of the yarn on opposite sides.

CHAPTER VIII

GENERAL INSTRUCTIONS

Equipment

A spinner needs the following equipment :

Spare spindles; spare *Mals* (*Bada* and *Chota*); old rejected *Chota Mals*; leather straps; a pair of scissors; a pen-knife; an oil can; an oil reservoir; slivers; coloured cloth; nails and wire; pins; a pencil and paper (to note down points that require attention); a small screw-driver; a small bottle of tincture iodine; a little absorbent cotton; a small finger bandage.

Closing the Box

To put the common charka away is a simple affair. You will find it convenient to cover it with a piece of cloth or hessian, to prevent dust accumulating on it. In regard to the Yerawada Charka, however, there are certain points to attend to. Let us assume you have done your day's job. *The old model charka has two receptacles* and the new model a single big one to hold odds and ends. You may put your stocks—*Mals*, leather pieces, pen-knife, scissors and spindles in these. But they will not hold the bobbin, which must be placed in the box by the side of the two wheels. The *Chota Mal is removed*, carefully folded, and placed in the box. The *Bada Mal* is generally retained in position, but it is better to loosen it before you close down. Then you have to bring the handle of the large wheel round as close to the speed wheel as possible so that it fits into the space in the lid by the side of the sliding pedestal. The second point is that you should push the sliding pedestal to the farthest extent, so

The thread sometimes snaps while you are hanking. One reason for this may be that it is caught up between the disc and the bobbin. If this condition persists, the remedy is to proceed with your operations with the bobbin standing on the butt-end of the spindle so that the sharp end points upward.

Folds in the thread must be straightened before the yarn is wound on the bobbin. When the thread snaps and there are twisted folds in it, it is advantageous to impart twist to the whole length of yarn and then straighten the fold, for, as often as not, the broken thread is loose and not fully twisted.

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that the handle of the large wheel may find room for itself inside the lid.

Sometimes the box fails to shut down tight owing to the sliding lids of the drawers inside being left open. They must first be properly closed.

You may argue that the closing of the box is too trivial a subject to dwell upon at this length. But there are a number of accidents to be guarded against in the process. I shall here mention only two:

(i) In pushing the pedestal to the farthest extent your fingers are apt to slip and prick themselves against a sharp wire—the end of the spring.

(ii) Never handle the sharp end of the spindle; much less with the palm of the hand. There is an artery called the palmar arch in the centre of the palm, which is apt to be pierced by the spindle. The consequences of such an accident are likely to be grave.

Distempers and Disorders

The music of the spinning wheel has become proverbial. There is no doubt that when a perfect wheel is in operation there is produced a most soothing hum, which might almost lull one to sleep. Whence exactly it emerges you may at first find it difficult to determine.

But a close investigation will reveal that it is the whirr of the yarn against the point of the spindle that produces the sound. Work at the wheel gently, turn the spindle slowly, and you will notice that every time the yarn tugs at the point it makes a 'tick'. Such sounds in quick succession set up that whirring which is musical if the production is rhythmic. Each wheel has its own peculiar music and so has each spindle. But apart from this pleasant hum, there arise from time to time unwelcome noises, which must be studied with reference both to their causes and remedies.

Here we have to deal with certain disorders and distempers of the spinning wheel. I have already said that the charka is a living organism, that it requires to be oiled and cleaned daily, or at least every alternate day. The mechanism will not tolerate any neglect in this matter. I have already referred to some of the distempers in passing. I shall summarize them here, referring, as we proceed, to ones not already discussed.

Just as a headache or fever is an external indication of a person's disturbed health, rattling noises during spinning are a symptom of the disturbed equilibrium of the charka. One is often puzzled by the various unwholesome sounds emanating from secret corners of the charka. You must be thoroughly acquainted with the physiology of the charka if you desire to study the pathology of the particular disorder and the methods of curing it. The music of the spinning wheel is a symphony of the notes produced at different places. The rattling 'burr' caused by a particular spindle or *mal* can easily be eliminated by replacing it with one of the right type.

(1) A loose *Chota Mal* produces a hissing sound, while one that is too tight produces an easily recognizable 'burr'. Both these conditions need to be remedied. For this purpose you must cultivate right judgment, depending on a trained perception of the mind and sensitiveness of the digits.

(2) A tight *Bada Mal* strains your shoulder and arm. It also produces a most unwelcome noise, which makes the seat of the disorder self-evident. This condition has to be removed.

(3) One day a friend of mine, a remarkably fine spinner, who had borrowed a brand-new charka, complained to me of noises in the wheel. But when I operated this particular wheel I noticed there was no noise at all.

The handle of the big wheel was a round one, not triangular. At first I thought the *Bada Mal* was tight. But how then could it function properly for me? I discovered eventually that he was pressing the handle on the head and that the *Bada Mal* was purring against the upper rim of the groove of the big wheel.

(4) Sometimes you experience some difficulty in turning the big wheel. It does not run smoothly. There may or may not be attendant noises. You must probe the cause. You have oiled both wheels. Neither the *Bada Mal* nor the *Chota Mal* is too tight. But have you oiled the spindle where it rests on the threads? Perhaps not. It is important to see that this lubrication has been attended to. It is only then that the big wheel responds smoothly.

(5) Yet another condition may account for such tightness persisting even after the oiling has been properly carried out. Examine the leather strips on either side of the metallic pulley. On one side perhaps the corners are folded against the wooden side either on the groove through which the *Chota Mal* passes round the pulley or at its sides. Place them aright and the wheel will run smoothly.

(6) There is yet another kind of distemper for which the leather strap is responsible. The strap sometimes forms a loop whose ends rest on either side of the pulley instead of lying loose and quiet on the off side of the groove in the sliding pedestal. Then it rotates as you draw the yarn and, jumping up, like an athlete on the trapeze, comes over to your side of the groove and rests on the *Chota Mal*, causing friction by contact. Gradually the *Chota Mal* cuts a notch in the leather. As the groove becomes deeper and deeper, the knot of the *Chota Mal* strikes against the groove and affects the speed of the wheel and sometimes even causes a sliding of the *Chota Mal* from the groove of the pully. This must be guarded against.

There are two ways of doing this. You may quietly imprison the fold of the leather strap in the groove in the sliding wooden pedestal by kinking it at the bottom of the groove, that is to say, the bottom of the leather loop must be folded on itself and fixed in the wooden groove so that it cannot move. Perhaps an easy way of obviating trouble of this sort is to have two separate leather bits, each ½ inch square. Sometimes you may find, however, that the outer square has slipped off the spindle and dropped—and this just as you are about to begin your day's work. At this psychological moment to find that your leather square has disappeared from sight is most annoying, particularly when you have no spare leather available. You must always be careful enough to provide yourself with spare parts, be it leather or *mal*, before the last bits are exhausted.

(7) We have incidentally referred to the trouble that arises when the leather strap causes dislocation of the *Chota Mal*. Such dislocation must be treated as a primary disorder, and its cause independently investigated. Very often I have been hard put to it to discover the cause. One feels helpless then for, right in the midst of a most exciting operation, the *Chota Mal* slips. It is as if the bicycle chain should slip while you are pedalling away for life, say, in a gruelling race. Very often the *Chota Mal* itself is to blame for the trouble. It has often too big a knot. This same knot might have been perfectly suited to some other spindle. That means that perhaps the spindle you are now using has a pulley with a very shallow groove. (It may either be that the groove is too shallow or that the knot is too big. It is all relative.) If it is the knot that is giving rise to trouble, cut it off and tie a fresh one. If the groove is shallow, flatten the knot by beating it down with a light weight. Sometimes the mere sliding of the pedestal a little farther achieves the

desired end. If, however, things do not improve and you feel baffled, simply put aside the charka for the time being; and when you resume spinning you will discover, much to your surprise, that the *mal* and the pulley, the groove and the knot have all mended their manners and are working smoothly.

(8) Sometimes the spindle wobbles, that is, it does not revolve properly on its own axis. When the spindle turns properly, its revolutions are hardly noticeable; it appears to be steady and motionless. But when it wobbles, you may clearly see the point vibrating. This makes spinning almost impossible, for vibrations of the sharp point cut the yarn. In other words, you must see that the spindle is true. That is easier said than done. But here is how you may set about the task. Hold the spindle at right angles in front of your right eye and examine it closely, with the left eye closed. Find out whether the spindle is truly straight or whether it has any defects. It is a particularly difficult thing to determine. At the model workshop in the village of Maganwadi, Wardha, I saw a boy entrusted with this job. He submitted the spindles to the necessary tests with extraordinary speed and earned something like six pies for every three passed. He made, as I found out, 10 annas a day—this urchin hardly 10 years old. He tested the spindle first in the manner described above, then let it spin like a top in front of him, when he would, by watching the revolutions, detect and locate flaws. With two simple instruments he would then proceed to set any defective spindle right. It was a quick job and he had earned his two pies. We cannot all possibly achieve this remarkable skill. At any rate, I haven't. But we can surely replace a defective spindle!

(9) When you use up the day's quota, say, 12 slivers (which may yield 300 yards of yarn) I have often noticed

that while the yarn spun earlier in the day is thin and fine, that spun from the last three or four slivers tends to be thick, uneven and lumpy. Is this due to exposure of the slivers for the space of an hour? Anyway it is best not to expose the slivers; you would do well to take them out three at a time, if not one at a time.

After writing the foregoing lines, I made a test to find out whether the theory of exposure was tenable. It is usual with me to decide in advance the number of slivers I shall spin on any particular day. Sometimes it is 21, sometimes 12, according to the girth and length of the slivers. While I am writing these lines the daily quota is 13. I took them all out and placed them beside me. I finished spinning ten slivers and then started operations with the next three. I was, of course, particularly careful and found that the yarn was quite of the best I could produce—which may not be very good, though *that* is a different matter. The exposure, it was evident, had not materially affected the slivers. In truth, the reason why some persons do not spin as well towards the end of the day's job as at the start appears to be merely that they are tired, and therefore inclined to be impatient, particularly if they have an important engagement to fulfil immediately after. If one becomes impatient in the effort to finish one's allotted quota, what is gained in volume is lost in quality.

(10) Sometimes the yarn you are winding slips over the metal disc and gets caught between the disc and the prong of the pedestal. This complication is due to your own carelessness in winding on the bobbin too near the rim of the disc after the bobbin is flush with the rim. You must avoid this, for it is not easy to unwind the yarn from the intervening spindle. For one thing, you may not be able to get at its end; for another, it may snap very

(16) A friend brought me a new spindle he had just bought in the market, complaining that it did not revolve when fixed on the charka. I tried it myself. It was as stiff as the yoke on a bullock's neck. Why would it not revolve? The spindle was apparently true, the hub all right, the disc faultless. The two *mals* were at just the right tension. Indeed, my friend said he had been getting on very well with his old spindle. There was, therefore, nothing the matter with the charka. Was it not obvious something was wrong with the newly-purchased spindle? This necessitated a careful examination of the spindle and its parts. The leather was stiff—very stiff indeed. It was oiled. The holes in the leather strap through which the spindle was passed were narrow and small, and gripped the iron rod of the spindle. These were enlarged. Then we tried the spindle again. It now revolved, but not smoothly: there was still some catch. A re-examination revealed the fact that the iron of the spindle was rusted. It was a moment's job to scrape off this rust. The spindle then worked as smoothly as one could ever desire. There wasn't any more coaxing or cajoling to do.

(17) Another friend invited me to look into the working of his wheel. The big wheel was not moving in a horizontal plane. It was wobbling—even as a hunchback does while walking. The defect, I found out, was due to a worn-out axle. He had spun over three or four lakhs of yards of fine yarn of 42 counts on the charka.

(18) Certain disorders are truly mysterious. Sometimes the big wheel does not run smoothly enough. You do not change either the spindle or the *Mals*, neither do you oil the mechanism. You just put the wheel aside and resume operations after a while—and find everything in perfect order. Or, it may be trouble with the spindle.

CHAPTER IX

SPINNING CALCULATIONS

1. Count

In determining the climate of any particular territory, its latitude, altitude, distance from the sea, rainfall, soil and other factors are taken into consideration. Similarly, in determining the 'Count' or fineness of yarn, we have to take into consideration its length, its weight and its thickness. The count, the weight and the length of yarn are interrelated. The length remaining the same, the count is in inverse proportion to the weight. Again, the weight remaining the same, the count is in direct proportion to the length. The count remaining the same, the length is in direct proportion to the weight.

From these arise three propositions:

(1) Given the length and weight, to find out the count of the yarn; (2) given the weight and count, to find out the length; (3) given the length and count, to find out the weight.

The following table is generally used in measuring yarn in mills:—

4½ feet = 1 Round

80 Rounds = 1 Lea (120 yds. or 90 rounds of 4 ft. each)

7 Leas = 1 Hank (840 yds. or 630 rounds of 4 ft. each)

The count is derived from English mill practice and is based on a hank containing 840 yards. If a hank of 840 yards weighs one pound, the yarn is of No. 1 count. If the yarn is finer, so that there are twice as many yards. (1,680) to the pound, then it is of No. 2 count. The count, therefore, is the number of hanks (each of 840 yards)

there are to the pound. This formula is generally used in determining the count of uniform yarn in large quantities.

Suppose you have x yards of yarn weighing y tolas. The following formula will enable you to calculate the count of that yarn:

$$\text{Count} = \frac{x}{21y}$$

Thus, if a hank of 840 yards weighs one tola, the count of the yarn is $\frac{840}{1 \times 21} = 40$. If its weight be one-half of a tola, the count is $\frac{840 \times 2}{21} = 80$. If a hank of 500 yards weighs 2 tolas, the count is $\frac{500}{2 \times 21} = 12$ approximately. In finding the count fractions less than $\frac{1}{2}$ should be dropped, while $\frac{1}{2}$ or fractions more than that should be taken as one unit.

The formula in use in mills may be rendered thus:

$$\text{Count} = \frac{\text{Length (in yards)}}{\text{Weight (in tolas)} \times 21}$$

This formula is applied with a little modification in finding the count of hand-spun yarn. In mill calculations a pound is taken to be equivalent to $38\frac{8}{9}$ tolas (7,000 grains) whereas it is reckoned as equivalent to 40 tolas in Khadi calculations for the sake of convenience.

The following table is used in measuring hand-spun yarn:

4 feet = 1 Round (1 Tar)
16 Rounds = 1 Kalee
10 Kalees = 1 Lattee
4 Lattees = 1 Hank (640 Tars or 853 $\frac{1}{3}$ yards)

The count of hand-spun yarn is denoted by:

(1) The number of rounds (tars) weighing one anna; (2) the number of kalees weighing one tola; (3) the number of lattees weighing ten tolas; (4) the number of hanks of 640 tars weighing one pound of 40 tolas.

Examples: (1) If ten tars of the yarn weigh 1 anna, the count is 10. (2) If 6 kalees weigh 1 tola, the count is 6. (3) If 12 lattees weigh 10 tolas, the count is 12. (4) If 15 hanks (of 640 tars) weigh 1 pound of 40 tolas, the count is 15.

Corollaries: (1) The number of hanks in a ½ seer (40 tolas) of yarn denotes the count of the yarn. (2) Half of the number of hanks in 1 seer of yarn denotes the count of the yarn. (3) $\frac{40}{\text{weight of 1 hank in totals}}$ = count of yarn.

2. Strength

Tensility, twist and uniformity contribute a good deal to the strength of yarn. The strength of yarn is generally determined by the weight it can support without breaking. Tensility is the capacity of the yarn and the fibres that constitute it of being stretched by weights attached to it until it reaches breaking point. The difficulty lies in maintaining an even pull and twist. One way to secure the right relation between pull and twist is to keep the spindle revolving at a uniform speed. To maintain the right balance between pull and twist you must learn to be guided by the sense of touch in the fingers of both hands, and to feel (through the fingers of the left hand and the muscles of the arm) the tension or amount of pull in the yarn and fibres as they are drawn from the sliver. It is a sort of constant awareness or consciousness, felt by the muscles and the sense of touch, of the relation between the weight of the spindle, the force and speed of the drawing and the strength of the yarn and of the fibres of cotton as they emerge from the sliver.

It is necessary to bear in mind that the process of twisting should be completed before you proceed to draw further yarn. Before drawing further thread from the sliver see that the yarn already drawn has been given twist in proportion to the fineness aimed at. This is the fundamental point governing the evenness, roundness and strength of the yarn. Yarn spun in this fashion will not be fuzzy and shabby as it would be otherwise. Almost every fibre being well gripped under the twist, you achieve economy in the use of cotton and at the same time maintain the strength of the yarn. Uniformity of yarn is no less important than its twist.

The strength of yarn may be briefly denoted by the following formula:

Strength = Twist + Uniformity + Tensility

HOW TO TEST THE STRENGTH OF YARN

Popular Method

Bundle ten hanks of yarn together. Lift the bundle with your fingers by one thread of the bundle. If the thread does not break, the yarn may be regarded as sufficiently strong.

Scientific Method

Get a wooden *Lapeta* or *Ateran*, one foot long. Wind six rounds of yarn over it without any break. Now a lattee is formed. Prepare three such lattees. Find the count of each.

Now take a balance with a single pan as shown in Diagram III in Appendix III. On one side of the rod is the pan. On the other side, there is an S-shaped hook attached to the rod. Attach one end of the lattee to the S-shaped hook and the other to another hook attached to

the wooden base. Now balance the scale and go on placing small weights, say 5 or $2\frac{1}{2}$ tolas at each stage, until the lattee is stretched to breaking point and gives way.

Now find the total of the weights in the pan. Add the weight of the pan also to the total. That gives the weight borne by the lattee near breaking point. This is after all an approximate calculation, because we cannot determine the exact portion of the last weight whose addition made the lattee give way. Now we find the strength of the lattee of yarn in terms of the weight borne by it at breaking point. Determine in this way the strength of each of the three lattees.

A lattee of yarn of count 1 can bear, if it is of 100 per cent strength, a weight of 3,600 tolas. If the yarn is of 10 counts, it should bear a weight of 3600/10 or 360 tolas. That is the weight it can bear if it is 100 per cent strong. If it is of 80 per cent strength, it will bear a weight of $\frac{360 \times 80}{100}$ or 288 tolas. In other words, if a lattee of yarn of 10 counts bears a weight of 288 tolas it is 80 per cent strong. From the foregoing you derive the following formula:

$\frac{3600}{Count}$ = Weight borne by yarn 4 yards long and 100 per cent strong.

From this formula we can find the percentage of the strength of any yarn.

In first class yarn you expect 90 per cent strength; in second class yarn 75 per cent strength; and in third class yarn 60 per cent strength.

In no circumstances should the strength fall short of 60 per cent.

The following table showing the relative strength of yarn of different counts is given for ready reference.

Count	Weight *borne* (in Tolas)	Count	Weight *borne* (in Tolas)	Remarks
1	2934	19	189	This is taken from a record of observations made by Sjt. B. Mehta in finding the strength of yarn of different counts. The figures are a little below the standard given in the formula.
2	1482	20	180	
3	1010	21	175	
4	963	22	171	
5	624	23	165	
6	480	24	159	
7	450	25	154	
8	390	26	150	
9	354	27	144	
10	324	28	138	
11	285	29	135	
12	264	30	132	
13	249	32	128½	
14	234	34	125	
15	225	36	121¾	
16	216	38	119	
17	201	40	116¾	
18	195			

Example:—Find the percentage of strength of 3 lattees whose counts and the weights they bear are as follows:

Lattee	*Tolas*	*Count*
1st	160	20
2nd	170	19
3rd	150	16

The averages of the weights and counts of yarn are 160 and 18 respectively.

Therefore, $160 : \frac{3600}{18}$: Required percentage: 100,

i.e. the required percentage $= \frac{160 \times 100 \times 18}{3600} = 80$

$$\frac{Count \times Tolas}{36} = \text{Strength (percentage)}$$

For all practical purposes we can follow this formula in finding the strength of yarn

3. Uniformity

Strength is incomplete without uniformity. Uniformity connotes harmony. It is therefore a quality that ranks very high.

How to find uniformity: Take six lattees of yarn from the same hank and find their counts separately. Then calculate the average count of the six lattees. Determine the difference between the highest count and the lowest. The 'disuniformity' of the yarn may be obtained by the application of the following formula:

$$\frac{100 \times Difference}{Average\ count} = \text{'Disuniformity' per cent.}$$

If the percentage of 'disuniformity' is subtracted from 100, we get the percentage of uniformity.

Example:—Six lattees from different parts of a given hank of yarn are of 16, 18, 15, 20, 22 and 17 counts respectively. The average is 18. The difference between the highest count and the lowest is $22 - 15 = 7$.

The 'disuniformity' of the yarn is

$$\frac{100 \times 7}{18} = 39 \text{ per cent (approximately).}$$

Therefore the percentage of uniformity is 61.

This is uniformity calculated on the basis of the count of yarn. We can also calculate the uniformity of yarn on the basis of its strength, by determining the percentages of strength of six separate lattees and applying the formula with suitable modifications.

For examination purposes the uniformity calculated on the basis of count and uniformity determined on the

basis of strength are both taken into account. The result is judged on the average of these two, marks being deducted for lumps formed in the yarn through over-twist or under-twist.

4. Twist

(1) The following formula is employed for determination of the twist per inch of yarn used for warp:

$$\text{Twist} = \sqrt{\text{Count}} \times 3{\cdot}75$$

Example: Suppose the count of the yarn is 16. The square root of 16 is 4. Its twist then is $4 \times 3{\cdot}75 = 15$.

The following is a table of the twists of different counts:

Count	*Twist*	*Count*	*Twist*
1	3·75	9	11·25
2	5·30	10	11·85
3	6·49	11	12·43
4	7·50	12	12·99
5	8·38	13	13·52
6	9·18	14	14·03
7	9·92	15	14·52
8	10·60	16	15·00

(2) The following formula is employed for determination of the twist per inch of yarn used for woof:

$$\text{Twist} = \sqrt{\text{Count}} \times 3{\cdot}5$$

Note: Yarn specialists have found that the twist constant ranges from 3·5 to 4, according to the quality of the yarn.

5. Diameter of Yarn

In arranging reeds and healds in looms for weaving cloth with different counts of yarn we have to take into account the diameter (*vyas*) of the yarn, which is reckoned

in terms of the number of threads placed closely side by side within the space of 1 inch. We can determine the diameter of yarn by the application of the following formula :

$$\text{Diameter of yarn} = \sqrt{\text{Count}} \times 27{\cdot}5$$

6. Miscellaneous

Given Punjam and length, to find out the number of hanks required for weaving a piece of cloth :

$$\frac{(\text{Punjam} \times \text{Length in yards} \times 2) + \text{Punjam}}{7} = \text{Number of hanks required.}$$

For example, if the Punjam is 15 and the length is 10 yards, the number of hanks required $= \frac{(15 \times 10 \times 2) + 15}{7}$

$$= \frac{300 + 15}{7} = \frac{315}{7} = 45.$$

$$\text{Punjam} = \frac{\text{Texture} \times \text{Width}}{120}$$

Note : 'Texture' means the number of threads contained in one inch of cloth either lengthwise or breadthwise. It is advisable to take the average of lengthwise and breadthwise threads in 1 inch.

CHAPTER X

SUMMARY

Most of the points mentioned hitherto may appear complicated, though in reality, they are ever so simple. I have *therefore summarized the whole process* below:

1. Before you begin to spin watch others at spinning.
2. When you make the attempt yourself, do not be discouraged by seeming failure in the earlier stages.
3. Exercise endless patience. Spinning requires patience, even as it teaches you that virtue and fosters it.
4. Make your own slivers even in the earliest stages.
5. Grow your own cotton, in the back yard of the house.
6. Clean the cotton on the verandah.
7. Card the cotton and sliver it in a store room.
8. Spin in the parlour.
9. Weave the yarn (or get it woven) in the front yard.
10. Remove any specks that may be visible both on the yarn and the bobbin.
11. Wind tight on the bobbin.
12. Do not make the bobbin too big and unwieldy lest the yarn should slip off and get into a tangle.
13. Hank the yarn on the bobbins carefully, following the instructions in this behalf.
14. Wet the hank and dry it.
15. Clean your machine carefully once every three days, and oil it too.
16. Polish the whole wood-work of the frame with the oil. (Every part of the charka needs oil.)
17. Keep your slivers pressed under a heavy weight and do not expose them to moisture.

18. If you do not begin spinning with the stump end of the sliver you will find it advantageous to reverse the sliver just when there is still a good inch or inch-and-half remaining.
19. The moment you notice that the yarn is uneven, break it off—for by continuing with operations you will lose both labour and yarn.
20. Do not think you spin merely as a sacrament. Spinning soon becomes a notable economy. When one of us during our *Agnathavasa* in the 'Unknown Fortress' (1942-44) wanted to buy a *dhoti*, a single one, we discovered, cost Rs 13. On the other hand, every one of us who carried on spinning easily produced enough yarn for a pair of *dhotis* in a month, or two at the most. And the weaving charges amounted only to Rs 2-8

CHAPTER XI

CONCLUSION

The great advantage of the Yerawada Charka is, as we have already emphasized, its portability; you can spin your day's quota (perhaps much more) while travelling by train, even while waiting to catch your train at a wayside station. It is as easy as doing your morning ablutions whether you travel third-class, Inter-class, or second-class. Indeed I may go so far as to say that plebian class travel affords greater facilities for the ardent spinner. The 'aristocrats' who travel second are less inclined to make room for your operations; they will claim every inch of the space allotted to them. In a third-class compartment, on the other hand, there is a spirit of greater accommodation; your fellow-passengers will obligingly give you elbow-room to proceed with your daily rite. Again, among the simple folk who travel third you excite a lively curiosity, in contrast with the arrogant look of indifference that you may provoke among the richer people you come across in the higher classes.

What a pleasure spinning can be with a large number of curious people looking on! They eagerly make room for you, extend a hundred little courtesies. You, on your part, reciprocate by carrying on a friendly conversation. The spectators, caught up by the soothing hum of the wheel and the magic of rhythmic production, ask questions; they want to know how it is done—and what is more, the whole background of hand-spinning and its present revival in India.

As you carry on, with the charka standing on a plank placed across the seats, you launch into the history of

spinning—its beginnings in India, the splendour of our achievements in times gone by, its decline, and, today, the powerful movement to revivify an almost dying craft under the guidance of Mahatma Gandhi. This is perhaps how your discourse will run, and how instructive and inspiring it can be!

You explain, let us say, how the West was not aware of even the existence of cotton till about the thirteenth century. How England imported fine cotton fabrics from India till 1803, through the East India Company, Ltd., which made colossal profits out of this trade. Then you trace the slow development of trends that eventually reversed the process of Import and Export. How in England they started a campaign against the lavish use of foreign cloth—how Queen Anne was criticized for wearing delicate Indian Calicoes, how Daniel Defoe reviled the squires and knights of his country for strutting about in Murshidabad silks, to the detriment of the spinners and weavers of English wool. How this growing hostility to the import of foreign fabrics led Parliament to pass laws in 1700 and 1735 penalizing wearers of Indian cloth with a fine of £5, sellers of such fabrics with a fine of £25 and persons who wrapped corpses in other than indigenous wool with a fine of £5.

The real menace began, as you may proceed to explain, when, after the invention of the steam engine in 1783, the spinning wheel and the weaving loom came to be power-driven. The story may go on to describing how in 1803 cotton fabrics worth Rs. 3 lakhs were imported into India from England—a stream that increased in volume to Rs. 29 lakhs in 1829 and to Rs. 72 crores in 1929. You may paint a vivid and convincing picture of the misery that this spelt for the Indian artisan—the spinner, the weaver, the dyer, the printer and the

bleacher—how he gradually lost his skill at his craft and by slow degrees his very means of livelihood.

From this bleak picture you may pass on to the decay of other auxiliary handicrafts. How agriculture itself, overburdened by the consequent migration of the new unemployed, fell on evil days. How the whole economy of India's rural life was thrown out of gear and poverty lay athwart the land.

If you set about your task to purpose and infect your listeners with your own fervour, they will hang on your words and you will, imperceptibly, lead them on to the great spirit of regeneration abroad in India and to Mahatma Gandhi, the apostle of Truth and Non-violence, who is now at the country's helm, directing it into ever-broadening channels of purposeful activity.

The sermon on which you are now fully launched will deal then with Gandhiji, his experiments with Truth, his Ashram at Sabarmati, his passion for hand-weaving and hand-spinning, his championship of Khadi (as hand-spun cloth is called) and for all village industries, his Satyagraha campaigns, his epic struggle for the attainment of Swaraj, his defiance of repressive laws, his leadership in the battle against British Imperialism, his readiness to suffer imprisonment (even as all his followers have gladly gone to jail, for in this grim fight it was prison for patriots and palaces for exploiters).

Then someone in the ring of enraptured listeners may ask: 'Have you been to jail, yourself?' And to that I might answer for myself: 'Not once, or twice, but six times have I been to prison in the country's cause. And for the last time in the 'Unknown Fortress' where I wrote this brochure.'

The charka has often been likened to Lord Vishnu's *Chakra*, the symbol of Victory. It is truly one of our most potent weapons in the struggle for freedom.

Spin for freedom, for Swaraj, Gandhiji exhorts us. Spinning is indeed a sacrament, and the charka is the badge of our economic and spiritual regeneration. The rhythmic hum of millions of charkas will surely rescue our country from her present economic degradation and bring Swaraj nearer. And the discipline and character-building that spinning entails will produce too the Valiant Soldiers of Truth and Non-violence that Gandhiji demands for carrying on our struggle.

APPENDIX I

SPINNING IN SCOTLAND

It is a matter of profound significance for us in India to know that today handspinning is again becoming the vogue in Scotland and Ireland. The following extract from the *Listener*, B.B.C. (London), will be read with keen interest:

'Old spinning wheels and handlooms are still being used to good purpose, said James Jeffs in "At Home today". He collected purely for use a large collection of spinning wheels, some Flemish, some Hebridean and some Shetland, each varying in design and service, but all working on exactly the same working principle. They always call a spinning wheel "She", and many of the parts have the most fascinating names. There is the Mother of All, the Maiden, the Footman, the Flier, Bobbin and Heek. He managed to rescue many of the wheels from the scrapheap and the ravages of the wood-worm, just in time, and uses them for spinning the yarn for his handloom. Wool is the raw material. It is possible to spin any kind of fibre, animal or vegetable. From the yarn so made his wife and himself weave on their handloom scarves, tablemats, tweeds, knit costumes, pullovers, socks and other garments.

'Perhaps you think all this hand-work is a bit "arty" and quite futile. It is no good trying to compete with machine-made goods at this time of the day? But I am not trying to compete with machinery. I am trying here, in the Spinning Wheel of Scotland, to revive interest in a national craft with an age-old tradition. I have talked about it and demonstrated it to a great many

societies and to institutes and schools as well, and I find there is growing interest in the old craft. It is immensely old and the essential process is the same. I find boys and girls at school are thrilled by the idea of thrusting an ordinary crochet hook through a potato and using it as a spindle to make really first class yarn. And as they learn the story of the craft, they learn at the same time much about geography and history, some of the principles of science and engineering, something about singing, for people used to sing as they spun. Spinning is a good starting point for teaching children all sorts of subjects, and it gives them the joy of using their hands and creating something at the same time. That is the great thing about a handicraft. There is joy in it and satisfaction. That is one reason for not letting this old craft be forgotten. William Morris realized this years ago. He saw that a creative thing like an art or craft is closely bound up with the kind of social life people have. He said, "What business have we with art at all unless we all can share it?"'

APPENDIX II

Koutilya's *Arthasastra* has a chapter on the 'Superintendent of Weaving'. But the weaving department here includes spinning as well. Here are the relative sections:

'The Superintendent shall employ qualified persons to manufacture suitable threads (*suthras*), coats (*varma*), cloth (*vastra*) and ropes.'

'Widows, crippled women, girls, mendicant or ascetic women (*pravrajita*); women compelled to work in default of paying fines (*Danda prati karini*), mothers of prostitutes (*Rupajeevis*), old women servants of the king, and prostitutes (*Devadasis*) who have ceased to attend temples on service shall be employed to cut wool, fibre cotton, pamile (*tulo*), hemp and flak.'

'Wages shall be fixed according as the threads are fine, coarse or of middle quality and in proportion to the quantity manufactured; and in consideration of the quantity of thread spun, those (who turn out a greater quantity) shall be presented with oil, dried cakes of myrobalan fruits (*Taila Amalak Odvartanil*) *.'

'They shall also be made to work on holidays (*Tithishu*) on payment of special rewards. Wages shall be cut if, making allowance for the quality of raw material, the quantity of thread spun is found to fall short.'

'Those who manufacture fibrous cloth, garments, silk cloth and woollen clothes and cotton fabrics shall be rewarded by presentations—for example scents, garlands of flowers or any other prizes of encouragement. Various

* As a balm to keep the head and eyes cool and an inducement to others to work in earnest.

Odvartan is the scented flour prepared in our homes which is rubbed on the body—mixed with oil or after oil has been rubbed.

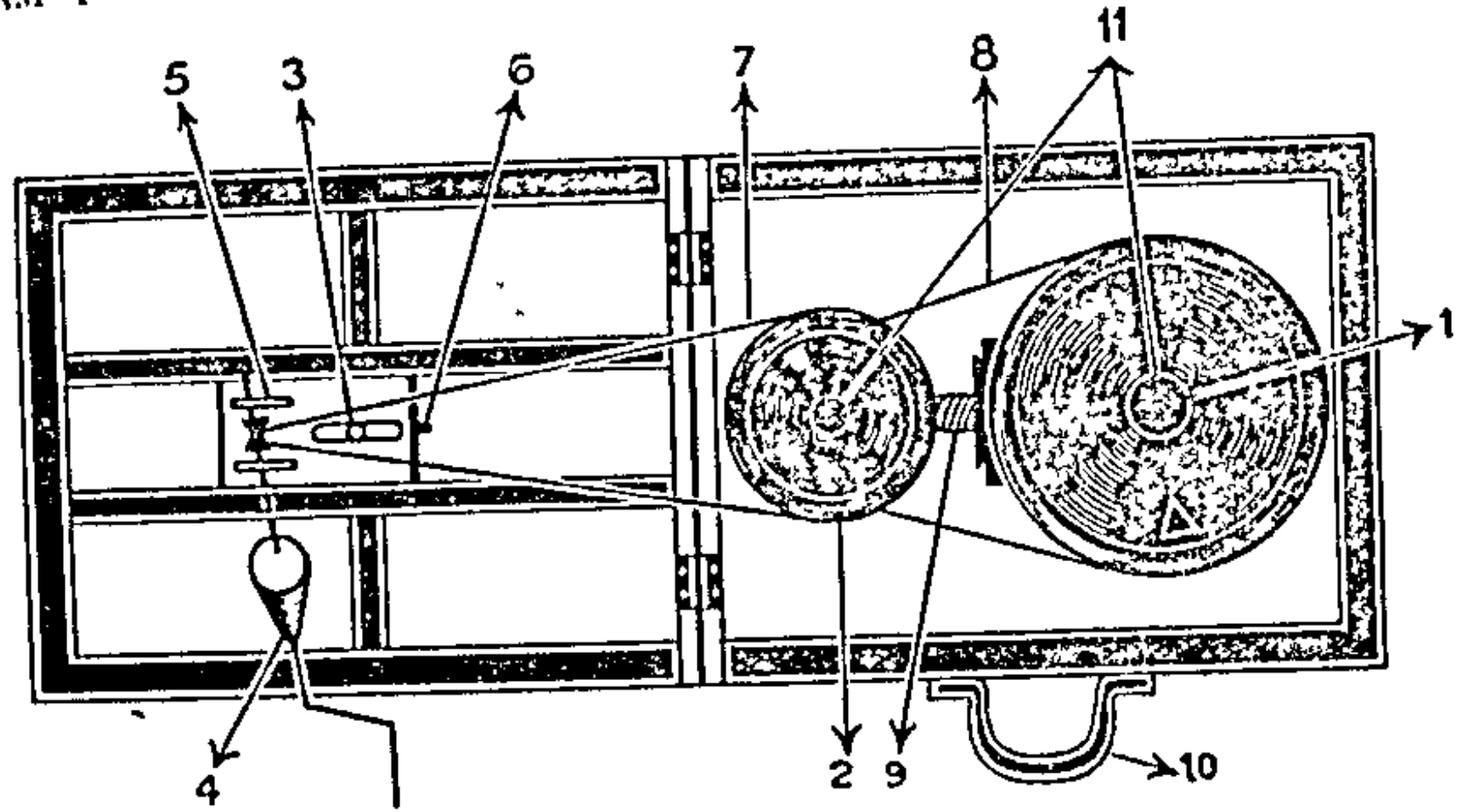
kinds of garments, blankets and curtains shall be manufactured. Those who are acquainted with the work shall also manufacture mail armour. Those women who do not stir out of their houses, those whose husbands are gone abroad and those who are crippled or girls may, when obliged to work for subsistence, be provided with works (spinning out threads) in due courtesy, through the medium of maid-servants (of the weaving establishment). Those women who can present themselves at the weaving house shall at dawn be enabled to exchange their spinnings for wages. Only so much light as is enough to examine the threads shall be kept. If the superintendent looks at the face of such women or talks about any other work, he shall be punished with first amercement.'

'She who having received wages does not turn out the work shall have her thumb cut off. Those who misappropriate, steal or run away with the raw material supplied to them shall be similarly punished. Weavers, when guilty, shall be fined out of their wages in proportion to their offence.'

APPENDIX III

THE YERAWADA CHARKA

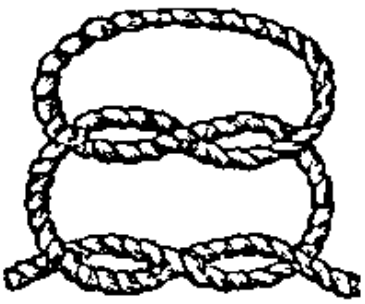
DIAGRAM 1



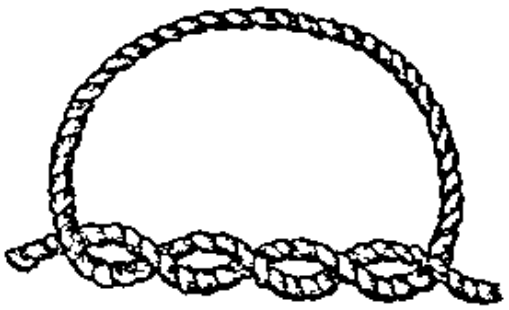
1. Big Wheel.
2. Small or Speed Wheel.
3. Prop to keep Pedestal erect.
4. Spindle.
5. Wooden Prongs.
6. Sliding Pedestal.
7. Chota Mal.
8. Bada Mal.
9. Spring.
10. Handle of Box.
11. Hubs of the Big and Speed Wheels.

DIAGRAM II

Knots for MAL



The Reef Knot
(Sailor's Knot)



Surgeon's Knot

DIAGRAM III

Determination of Strength of YARN